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THE CHEMIST SERVES CITRUS GROWERS AND USERS OF CITRUS FRUITS

A radio talk by Dr. H. G. Knight, chief, Bureau of Chemistry and Soils, delivered Friday, September 9, 1932, in the Department of Agriculture period, National Farm and Home Hour, broadcast by a network of 48 associate NBC radio stations.

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SALISBURY:

It's my pleasure to present to you again Dr. Henry G. Knight, chief of the Bureau of Chemistry and Soils. Dr. Knight brings us today the second of his series of 12 talks reporting results of experiments on problems of the various agricultural industries. Last week Dr. Knight gave us a most interesting review of the findings of chemical research on problems of the apple industry. Today he will report to us results of chemical research that have aided citrus growers, and outline the continuing program of research on the present problems of the industry.

Citrus growing is a major farm industry in the Gulf Coasts section and in the Southwest. You can grasp its size from the fact that the investment in citrus groves is now more than a billion and a half dollars. In 1930, the last year for which we have complete figures, citrus growers realized more than 135 million dollars from their crop. The importance of the citrus industry to consumers lies in the fact that its products are sources of the anti-scorbutic vitamin C which aids development of bones and teeth, and also of basic minerals which help keep the metabolic processes of the body in balance.

Now for the report on chemical and soils research in aid of the citrus industry. Ladies and gentlemen, Dr. H. G. Knight.

KNIGHT:

It is a pleasure indeed to visit again with you people of the Farm and Home Hour audience.

The men who are growing citrus fruits face the individual problem of caring for their groves. They face the common problem of bringing about the most complete use of their products. Both the individual and common problems of citrus growers will become more pressing in the next few years as millions of new trees, especially in Texas, reach bearing age.

In past years the chemists of the U. S. Department of Agriculture have helped citrus growers to solve many of their problems. They are continuing their work.

Chemical research of the recent past has practically revolutionized the distribution end of the American citrus industry. The results of chemical research have given the industry its maturity standards, the ethylene method of coloration, and a by-product industry which opens profitable outlets for some of the lower grade part of the crop.

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Soils research of the past has led Florida citrus growers to add manganese sulphate to their fertilizer mixture and thus to increase tree growth and quality of fruit, especially of the calcareous soils of Florida.

As an example of the assistance given the citrus industries by chemical research, take the maturity standards. I suppose most of us can tell the difference between a green peach and a ripe peach at a glance, but citrus growers found by sad experience that they couldn't tell by looking at an orange whether it was ready for shipment. They came to the Bureau of Chemistry with their problem. Our men developed chemical standards for determining maturity and the state of California gave legal endorsement to these standards. Leaders of the citrus industry in California have estimated that the application of these standards increased the value of citrus fruit at least 35 cents per box during the first 5 years the standards were in force. Of course these standards have increased the value of the fruit to the consumer.

An orange may be still green in color yet be ripe. The ethylene treatment hastens coloration of ripe oranges and thus puts more attractive fruit on the market earlier in the season. It has brought big returns to citrus growers. Prominent leaders of the Florida citrus industry estimate that the ethylene treatment added approximately 50 cents to the market value of each box treated during the 1930-31 season, and thus increased the value of the Florida orange crop at least 4 million dollars in this one year. The ethylene method was developed in the Bureau of Chemistry and Soils. It is covered by a public service patent and therefore is available to all citrus growers without the payment of royalties.

In California alone the citrus by-product industry, entirely based upon the pioneer chemical research of the Department of Agriculture has to date yielded the growers a total of 7 million dollars out of material that used to be a waste. By making orange and lemon oils, citric acid and citrates, and citrus pectin from cull and surplus oranges and lemons, this industry has salvaged thousands of carloads of fruit which otherwise would have been a dead loss. During a recent year of an enormous lemon crop, 78 thousand tons of lemons went to the by-products factories. If growers had found it necessary to place all this enormous crop on the fresh fruit market prices would have been ruinous. But because chemical research had developed methods of making by-products from cull and surplus lemons, a part of the crop found profitable use as by-products, and the other part of the crop sold as fresh fruit brought the second largest total return in the history of the lemon industry.

Well, so much for the past achievements of chemistry in the development of maturity standards, the ethylene treatment, and by-products industries for the benefit of citrus growers and users. At present the Department is working on 6 major problems of the citrus industry. The work is carried on at branch experiment stations in California, Florida and Texas.

Two of the lines of research have to do with the individual grower's problem of proper care of his citrus orchard. The soils men are trying to discover the best fertilizer and soil treatment methods and the chemists are experimenting with new and more efficient chemicals for control of insects and plant diseases.

Chemists also are making 4 major investigations into the problems of making efficient use of cull and surplus citrus fruits. These lines of investigation



have to do with preserving orange juice and grapefruit juice, extending the possible storage period of canned grapefruit, salvaging the waste products from canning plants and obtaining from these waste products flavoring oils and pectin and utilizing the residue left over after processing citrus fruits either as stock feed, as fertilizer, or as raw material for other industries.

The men working on the soil problems of citrus growing in the southeast are seeking the answer to a problem that causes hot arguments among Florida citrus growers. This is the problem of the effect of lime upon the yield and quality of citrus and the further problem of what soil treatments produce the best results on the different types of soils. The previous success of the soils scientists who discovered the need of many Florida soils for manganese gives promise that they will solve the problem they now are working upon.

For 50 years, our chemists have been investigating poisons for control of insect pests of citrus. An object of their present work is to find new insect poisons which will be more deadly to the citrus insects and less injurious to citrus trees than those now in use. At present citrus growers spray with oil emulsions or fumigate with deadly hydrocyanic gas under tents to kill scale insects. It takes powerful doses of these chemicals to kill the pests -- so powerful that if the dose is just a little bit too strong it injures the tree. Our chemists are experimenting with fluorine compounds as killers of citrus insects. They also are trying to find more efficient chemicals to use as washes or coatings to destroy or prevent mold or bacterial infection of the skins of these fruits and thus cut down the losses due to spoilage during shipment or in storage. For this purpose they are trying out a number of copper compounds such as copper oxide copper sulphide, organic compounds of copper, and copper fluoaluminate. If this latter chemical proves out, it will serve to kill both insects and disease fungi.

Now I have just time to tell you briefly about the research that's under-way to extend the utilization of citrus fruits.

Turning cull or excess oranges into juice appears to be the most profitable means of making use of them. But orange juice when handled by methods used for other fruit juices loses its good flavor. We are trying to develop a method which will preserve the natural flavor of orange juice for a period of from 6 to 8 months. We have started by investigating all recent methods of pasteurization and freezing storage of various types. We also are working on methods of preserving grapefruit juice and of extending the period for which canned grapefruit will keep in storage.

But you can see that even if the chemists conquer these problems, there still remains the problem of making use of the wastes left over from juicing and canning citrus fruits. The final residues from these methods of making citrus by-products contain elements too valuable to be discarded if growers are to realize the greatest return from the citrus crop. The wet waste from citrus juice plants or canneries makes good feed for dairy cattle and sheep, but of course it has to be fed locally and immediately. There aren't enough dairy cattle and sheep in the immediate vicinities of the canning and juicing plants to use all of the wet waste. So we are trying to develop methods of deriving flavoring oils and pectin from citrus cannery waste. We also see promise for effective use of the waste by reducing it to humus for use as a fertilizer in the groves.

Well, that seems to bring us right back to where we started -- the individual's problem of managing his grove.

In closing this visit with you, let me again invite you to write to the Bureau of Chemistry and Soils in the U. S. Department of Agriculture for more detailed information on any of these chemical research results which give promise of being useful to you. Good by folks until two weeks from today.

SALISBURY

Thanks again, Dr. Knight, for an interesting talk full of useful facts. We look forward to our next visit with you on Wednesday, September 14. I understand that then you will tell us about chemical research on problems of growing and using cotton.

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